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Notes on Flowerpeckers (Aves, Dicaeidae)

3. The Species Group *Dicaeum concolor* and the Superspecies *Dicaeum erythrothorax*

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The first part of the review of the large genus *Dicaeum* (Salomonsen, 1960, Amer. Mus. Novitates, no. 1991) dealt with the more primitive species within the genus. In the present paper the four related species forming the *concolor* species group, and the superspecies *erythrothorax* and its allies, are discussed. The remaining, more advanced species of *Dicaeum* will be treated in another paper.

Dicaeum hypoleucum

The systematic position of this Philippine species is not clear. It is dull colored, with grayish or whitish under parts, which indicates affinity with other Philippine species, such as *D. bicolor*, *D. australe*, and their allies. Still, the similarity between *D. hypoleucum obscurum* and *D. concolor* (especially the *minullum* group), also suggests close relationship, although it is true that *concolor* appears to be nearer to *pygmaeum*, which is another Philippine species, than to *hypoleucum*. Probably all three species are nearly related, although Mayr (1945, in Delacour and Mayr, Zoologica, vol. 30, p. 115) finds that *D. h. obscurum* and *D. concolor* differ in so many characters that any possibil-

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ity of close relationship must be eliminated, in spite of their superficial similarity.

As far as the bill structure is concerned, *hypoleucum* appears to have reached an advanced stage. The bill is slender and attenuated, even slightly thinner than that of *trigonostigma*. In *pygmaeum* and *concolor*, as well as the near ally of the latter, *erythrorhynchos*, the bill is still thinner and finer and also shorter than in *hypoleucum*, and slightly more downcurved, most obviously so in *erythrorhynchos*. The coloration of the plumage in these species, on the other hand, is primitive, usually brownish or grayish, only *pygmaeum* having glosssy upper parts, which vary geographically in intensity. However, the dull coloration may be secondary, as pointed out by Mayr and Amadon (1947, Amer. Mus. Novitates, no. 1360, p. 19). It is noteworthy that in both the species *hypoleucum* and the species *pygmaeum* the subspecies inhabiting the northern Philippine Islands are more similar to *concolor* than those inhabiting the southern islands. These latter have deviated considerably from the *concolor* stage and have reached a more advanced one, which includes a stronger sexual dimorphism, among other characters. I am sure that the four species *hypoleucum*, *erythrorhynchos*, *concolor*, and *pygmaeum* are close relatives, but it is true that *hypoleucum* stands somewhat apart from the other three and has a slightly more primitive bill form. It has larger body proportions than *pygmaeum*, but *erythrorhynchos* and *concolor* bridge this difference, although they are closer to *pygmaeum* in size.

Dicaeum hypoleucum is an inhabitant of the lowland rain forest, reaching almost sea level and in the mountains penetrating the lower zone of the mossy forest. In Luzon it has been recorded by Whitehead (1899, Ibis, ser. 7, vol. 5, p. 234) up to an altitude of about 1500 meters, while in the Katanglad Range in central Mindanao it was found up to an elevation of about 1800 meters, and in the Diuata Mountains up to 1350 meters by the Danish Philippine Expedition of 1951–1952. It has been collected on Mt. Malindang at an altitude of 1350 meters (specimens in the Chicago Natural History Museum) and on Mt. Apo at 1450 meters (specimens in the Philippine National Museum, Manila). It appears everywhere to be a rather uncommon bird, but is most frequently met in the mid-mountain zone. Owing to the destruction of the lowland forests it is apparently now in many places restricted to the mountains, as in Luzon.

The geographical variation of this species has been studied by means of material numbering altogether 116 specimens, belonging to the American Museum of Natural History (28 specimens), Zoological Museum,

Copenhagen (13), Museum of Zoology, Ann Arbor, Michigan (three), Chicago Natural History Museum (18), United States National Museum (23), British Museum (Natural History) (24), and Philippine National Museum, Manila (seven). All the types have been examined.

Dicaeum hypoleucum obscurum Ogilvie-Grant, 1894

TYPE LOCALITY: Luzon.

This form, restricted to Luzon, has the upper parts brownish olive-green, the under parts light grayish green, with a yellowish tinge, and the bill and the legs pale flesh-colored. There is no sexual dimorphism in coloration. The wing length of seven adult males is 55–57.5 (average 56.2) mm.; of four adult females, 53–53.5 (average 53.2) mm. All specimens examined were collected in Benguet Subprovince, Mountain Province, i.e., in the mountains.

Dicaeum hypoleucum pontifex Mayr, 1946

TYPE LOCALITY: Dinagat.

Differs strikingly from *obscurum* in having upper parts dark brownish, with only a slight olive tinge, under parts pale gray, without any yellow or green, and bill and legs blackish. Males and females are virtually identical in coloration.

There is a slight altitudinal variation in size, the mountain birds being larger, attaining about the same proportions as those of *obscurum*. The wing length is as follows: Samar and Leyte (lowlands), 14 adult males, 49–54 (average 51.5) mm., 10 adult females, 46–50 (average 48.2) mm.; lowlands of eastern Mindanao, five adult males, 52–54 (average 52.8) mm., two females, 50, 51 mm.; the mountains of eastern, southern, and central Mindanao, collected at altitudes above 1000 meters, six adult males, 54–57 (average 55.5) mm., four females, 50–53.5 (average 51.8) mm.

The range of this distinct form covers Bohol, Samar, Leyte, Panaon, Dinagat, and Mindanao except the western provinces (Lanao, Misamis Occidental, and Zamboanga). Specimens from all the islands mentioned, except Bohol, have been examined, the material from Mindanao including specimens from the provinces of Surigao, Bukidnon, Cotabato, and Davao.

There is some local variation within this subspecies, particularly in the shade of the brownish color on the upper parts, which may be more olive or may tend towards grayish brown. This variation appears to be due partly to differences in the state of wear of the plumage in the specimens examined and, at any rate, does not follow any geographical

trend. The specimens from Samar and Leyte, however, are apparently slightly warmer and darker brown on the upper parts than Mindanao birds, but this difference may be due to foxing, as the Samar-Leyte specimens examined are much older skins.

This form was called *Dicaeum everetti* by Tweeddale (1877, December, Ann. Mag. Nat. Hist., ser. 4, vol. 20, p. 537). The type, which is in the British Museum, is an immature specimen from Dinagat. As this name is preoccupied by *Dicaeum everetti* (Sharpe), 1877 (January), the designation *pontifex* was substituted by Mayr (1946, Zoologica, vol. 31, p. 8). There is, however, another name for this bird, namely, *Dicaeum modestum* Tweeddale (1878, Proc. Zool. Soc. London, p. 380), based on a specimen from the island of Panaon, also in the British Museum. This specimen appears very similar to the type specimen of *everetti*, but, strange to say, Tweeddale did not in his description of *modestum* mention *everetti*, which he described only one year previously. Sharpe (1884, Proc. Zool. Soc. London, for 1883, p. 580) has already shown that *modestum* is a synonym of *everetti*. Fortunately, *modestum* is preoccupied by *modestum* (Hume), 1875, and consequently *pontifex* remains the first available name for this subspecies.

Dicaeum hypoleucum mindanense Tweeddale, 1877

TYPE LOCALITY: Zamboanga Province, Mindanao.

This form, which inhabits the western peninsula of Mindanao eastward to the province of Lanao, differs from *pontifex* in having the upper parts distinctly darker and colder brown and the under parts paler, grayish white, with the throat virtually pure white; the two sexes are identical. Among the specimens examined, only one differs from the description, viz., a male from Diway, Dabiak, Zamboanga Province, collected by Rabor in 1952 (in the Chicago Natural History Museum). This bird has dark, blackish brown upper parts and very light, almost white under parts, in this way being closer to nominate *hypoleucum* than to *mindanense*. The coloration of this specimen indicates recent gene flow between the population of Zamboanga (*mindanense*) and that of Basilan (*hypoleucum*), but it is obviously a rarely occurring phenomenon. Generally the coloration is quite constant, in agreement with the description given above, and *mindanense* constitutes a distinct form, well differentiated from *hypoleucum* as well as from *pontifex*.

Just as in *pontifex*, there is in *mindanense* a slight altitudinal variation in size. The wing length of five males from the lowlands measures 52–55 (average 53.1) mm.; of five females, 49–51 (average 50.1) mm. Four males from the Malindang Range, collected at altitudes between

800 meters and 1350 meters, measure 52–56 (average 54.3) mm.; three females, 52–56 (54.0) mm.

Specimens of *mindanense* from Mt. Malindang in Misamis Occidental (eight specimens), and from Dagadion (one), Dabiak (one), Katipunan (three), San Ramon (one), and Pasananca (one) in Zamboanga Province, have been examined. The single specimen from Lanao Province (an adult male collected by Mearns in 1906 at Catagan, at an altitude of 300 meters, kept in the United States National Museum) also belongs to this subspecies. The type specimen of *mindanense*, in the British Museum, is sexed as a male, but, as the wing length is only 51 mm., it is most probably a female.

This distinct form has remained unrecognized and has been confused with both *hypoleucum* and *pontifex*, owing to lack of sufficient material. Mayr (1945, in Delacour and Mayr, *Zoologica*, vol. 30, p. 115) restricts *everetti* (= *pontifex*) to Samar-Leyte and extends the range of nominate *hypoleucum* to include all Mindanao besides Basilan and the Sulu Islands, stating that "there do not seem to be any clear-cut differences between specimens from Basilan and Mindanao." This mistake was repeated by Mayr in 1946 (in Delacour and Mayr, *Birds of the Philippines*, p. 224).

Dicaeum hypoleucum hypoleucum Sharpe, 1876

TYPE LOCALITY: Basilan.

This form differs strikingly from the other subspecies in having a pronounced sexual dimorphism. The males have the upper parts pure black and the under parts almost pure white; the females are virtually indistinguishable from those of *mindanense*. This is the form of Basilan and the Sulu Islands, where it is known from Bongao, Siasi, and Jolo. Specimens from all these islands have been examined by me. They do not exhibit any geographical variation, either in coloration or in size. The wing length of 13 males from Basilan is 52–55 (average 53.3) mm., of eight females, 50–52 (average 51.3) mm.; of six males from Sulu Islands, 53–56 (average 55.2) mm., of nine females, 49–54 (average 51.8) mm.

Dicaeum erythrorhynchos

This Indian species is a small, plain bird with olive-brown upper parts, paler, grayish brown under parts, and a short, attenuated, down-curved, flesh-colored bill. The sexes are alike. It frequents gardens, orchards, groves of deciduous trees in open country, and edges of forests in the lowlands and the foothills. It does not ascend to altitudes higher

than 1200 meters, except in the southernmost part of its range, where it is found up to the summits of the hills in Travancore, i.e., up to about 1800 meters (Whistler and Kinnear, 1934, Jour. Bombay Nat. Hist. Soc., vol. 37, p. 285), and over 2100 meters in the hills of Ceylon (Phillips, 1953, A revised checklist of the birds of Ceylon, p. 102). It appears to be entirely dependent on the fruits of the tree parasites *Loranthus* and *Viscum* for food.

Dicaeum erythrorhynchos erythrorhynchos (Latham), 1790

TYPE LOCALITY: India, restricted to Bombay.

This continental form ranges over the greater part of India, being absent only from Pakistan and the western drier parts of Rajasthan; it has been recorded from Kathiawar, but not from Kutch (Ali, 1955, Jour. Bombay Nat. Hist. Soc., vol. 52, p. 787). It appears to be rather scarce in the eastern lowlands, east of the Eastern Ghats, according to Whistler and Kinnear (*loc. cit.*). To the northwest it has been recorded as far as Kangra (Dharmasala), and from there the northern limit of its range follows the foothills of the Himalaya as far east as Dibrugarh in northern Assam. In Nepal it is found in the Terai up to an altitude of about 300 meters (Ripley, 1950, Jour. Bombay Nat. Hist. Soc., vol. 49, p. 409; Rand and Fleming, 1957, Fieldiana, Zool., vol. 41, p. 197). To the east it is commonly distributed as far as the Burmese border, but then rapidly diminishes in numbers, although it appears to be widespread still in the valley of the upper Chindwin. It is local and scarce in Arakan, and from the rest of Burma there is one certain record only from the Southern Shan States and one from Tenasserim.

An extensive series of this form has been examined in the British Museum.

Dicaeum erythrorhynchos ceylonense Babault, 1920

TYPE LOCALITY: Ceylon.

Similar to nominate *erythrorhynchos*, but distinctly darker on the upper parts and slightly darker on the under parts. This well-differentiated form inhabits Ceylon. A large series, including the type, has been examined in the British Museum.

Dicaeum concolor

This species is a very close relative of *erythrorhynchos*, with which it forms a pair of sibling species. Generally speaking, the two differ only in the color of the bill, which is blackish in *concolor* and yellowish

flesh-colored in *erythrorhynchos*.¹ Nevertheless, in southwestern India (Travancore and Cochin) the two species may occur in the same locality, but are not easy to distinguish, even when in the hand (Ali and Whistler, 1936, Jour. Bombay Nat. Hist. Soc., vol. 38, p. 777). The ecology is similar, particularly in regard to the food habits. Only nominate *concolor* has a different habitat selection. While the other subspecies frequent scattered tree groups in open country, orchards, gardens, and dry deciduous forest, nominate *concolor* prefers evergreen and moist deciduous forests. This subspecies inhabits southwest India and occurs there sympatrically with *erythrorhynchos*, its close ally. Evidently, this latter species frequents more open country in southwest India. In addition, nominate *concolor* has a preference for the hill slopes from 800 meters to 1200 meters, while *erythrorhynchos* generally is found at lower elevations (Ali and Whistler, *loc. cit.*). In the greater part of its range *concolor* is a lowland and submontane bird, which rarely ascends to altitudes higher than 1000 to 1200 meters, but *D. c. olivaceum* in its northern range (Assam, northern Burma) sometimes is found at higher elevations, and in the mountainous country of Yunnan it frequents altitudes from 2400 meters to 3300 meters (Rothschild, 1926, Novitates Zool., vol. 33, p. 319; Gee, Moffett, and Wilder, 1948; Tentative list of Chinese birds, p. 320).

Dicaeum concolor concolor Jerdon, 1840

TYPE LOCALITY: Malabar coast, southwest India.

In the coloration of the plumage the nominate form resembles *erythrorhynchos ceylonense*, although it is not quite so dark, but at any rate it is much nearer this form than to nominate *erythrorhynchos*.

This form is restricted to the country of the Western Ghats and the coastal strip of southwest India north to Khandala and Mahabaleswar, and south to Cochin and Travancore, including the hills of Mysore and the Nilgiri and Palni Hills. It prefers hill slopes of from 800 meters to 1200 meters, being more infrequent in low country. Older statements about its occurrence in the Central Provinces, still accepted by Stuart Baker (1926, The fauna of British India, Birds, ed. 2, vol. 3, p. 430), have been refuted by Hume (1879), Oates (1890), and, more recently, by Whistler and Kinnear (1934, Jour. Bombay Nat. Hist. Soc., vol. 37, p. 285).

Nominate *concolor* is widely isolated from the main range of the

¹ It is noteworthy that this is one of the characters that also serve to distinguish *Dicaeum hypoleucum obscurum* from the other subspecies within that species.

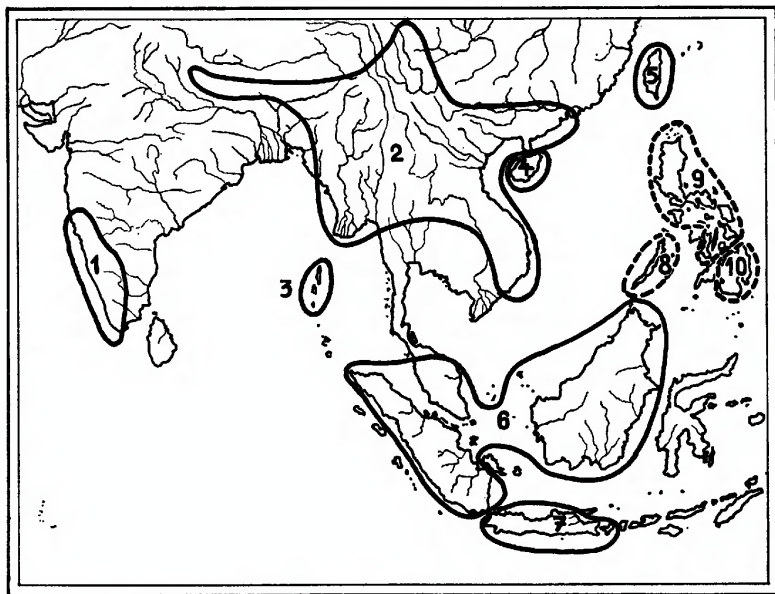


FIG. 1. The distribution of *Dicaeum concolor* and *Dicaeum pygmaeum*. Solid line: *D. concolor* (1, *concolor*; 2, *olivaceum*; 3, *virescens*; 4, *minullum*; 5, *uchidai*; 6, *borneanum*; 7, *sollicitans*). Dashed line: *D. pygmaeum* (8, *palawanorum*; 9, *pygmaeum*; 10, *davao*).

species (see fig. 1). The remaining subspecies, which form the *minullum* group, are distributed in the Burmese and Malaysian subprovinces. The western limit of the *minullum* group, in Assam and Burma, is shared by numerous other Burmese species, in the flowerpeckers, for instance, by *Dicaeum chrysorrheum*, *trigonostigma*, *cruentatum*, and the *modestum* group of *agile*. The discontinuity in the distribution of *concolor* indicates that nominate *concolor* is a relict form of Burmese-Malaysian origin. A similar distributional pattern is found in a considerable number of animals and plants, which possess a population in southwestern India cut off from their nearest congeners in Burma and Malaysia. Evidently this eastern element in the flora and fauna of southwest India constitutes remnants of species with a former distribution that stretched without interruption across the Indian Peninsula, most probably over the Satpura trend of mountains. This phenomenon, which is of far-reaching significance, has been the subject of much research and discussion, well summarized by Ali (1953, *The birds of Travancore and Cochin*, pp. 6-10).

I have examined the extensive series of this form in the British Museum and failed to find any essential geographical variation within

its limits. Stuart Baker (1921, Bull. Brit. Ornith. Club, vol. 42, p. 12) has separated the northern population, inhabiting the area from Belgaum to Khandala, as *subflavum*, which is said to differ from nominate *concolor* in having the forehead and lores pure white, the upper parts paler and greener, and the under parts more yellow and less gray. I have examined his original series (only four specimens, including the type) in the British Museum and found that these birds, compared with specimens from more southern localities, were slightly paler, more grayish green, on the upper parts, and had a slightly greater extension of white on the front, while I failed to see any difference in the color of the under parts. The differences between the populations are only slight, and some specimens are indistinguishable. I do not find it advisable, therefore, to recognize this form. Both Ali (1953, The birds of Travancore and Cochin, p. 192) and Whistler and Kinnear (*loc. cit.*) state that *subflavum* requires confirmation, and the latter students add that three specimens from the Nilgiris could not be separated from the Belgaum specimens.

Koelz (1939, Proc. Biol. Soc. Washington, vol. 52, p. 121) described the birds from the Palni Hills as *unicolor*, stating that they were larger and darker than Nilgiri specimens, with less green in the plumage, especially below, and with the light forehead less marked. He gives the wing length of seven males of *unicolor* as 49–52.5 mm., compared with 47.5–50 mm. for three males of *concolor*. I have examined two specimens from Kodaikanal, the type locality of *unicolor*, and compared them with specimens from the Nilgiri Hills and other localities, and found that all these birds are virtually indistinguishable; if anything, the Kodaikanal birds are slightly paler. Whistler (1941, Ibis, ser. 14, vol. 5, pp. 312–313) has already pointed out that it is not possible to recognize *unicolor*, the size difference being negligible and the supposed differences in color being merely such as are found in any series of the nominate form, owing to different stages of wear and fading.

Summarizing, it may be said that a very careful examination of adequate material may reveal the existence of a vaguely defined cline for increasing paleness from south to north, but the differences even between the end links will prove to be so slight that it is quite out of the question to base any subspecies on them.

Dicaeum concolor olivaceum Walden, 1875

TYPE LOCALITY: Toungoo, southern Burma.

Differs strikingly from nominate *concolor* in coloration and body size. The upper parts are dark and green, not pale brown, the under

parts are grayish green, suffused with yellow, and the flanks are strongly marked with dark grayish green, while in nominate *concolor* the under parts are light cream-colored, with pale grayish flanks. The proportions are much smaller, the wing length in adult males measuring 45–49 mm., compared with 50–53 mm. in *concolor*. The morphological gap between *olivaceum* and *concolor* is much greater than that present between *olivaceum* and all the subsequent subspecies, which all are closely related. It is natural, therefore, to separate a *concolor* group, consisting of the nominate form only, from a *minullum* group, which includes all the other subspecies.

Dicaeum c. olivaceum has a wide distribution in southeastern Asia, from Nepal and Sikkim eastward to Assam, including the Khasi Hills (Shillong), the Naga Hills, and Manipur, in the northern part of Assam ranging from the lowlands right up to an altitude of more than 2000 meters. In Burma it appears to be rather scarce, but it has been recorded from all provinces except the Chin Hills and Northern Shan States, and in Tenasserim it is found only south to Moulmein, where, however, it is rather plentiful (Lowe, 1933, *Ibis*, p. 282). In Siam it is restricted to the northern mountainous parts of the country, where it has been recorded up to an elevation of 1700 meters, but it does not occur farther south than about latitude 17° N. In Indo-China it is apparently absent in Cambodia and Cochin-China, but breeds throughout Annam, Laos, and Tonkin, extending its range to the north into southern China, where it is found in southern Kwangtung (north to about Canton), Kwangsi, southeastern Yunnan (north to Mengtsz), all of western Yunnan, and southwestern Szechwan (Omei Shan). In western Yunnan it breeds at altitudes of between 2400 and 3300 meters.

I have examined the extremely rich material in the British Museum, including series from Nepal, Sikkim, Bhutan, Assam, Burma, "S. China," Yunnan, Tonkin, Annam, and Siam, and failed to find any essential differences between the populations in this huge distributional area. Riley (1938, *Bull. U. S. Natl. Mus.*, vol. 172, p. 518) states that specimens from Tonkin, Laos, and southern Annam are darker and duller above and considerably lighter below than Siamese specimens. I have examined two males from southern Annam, in Naturhistoriska Riksmuseet, Stockholm, collected by Björkegren. They appear to be slightly paler on both the upper parts and the under parts than typical *olivaceum*, but the differences are of too weak an order to give rise to subspecific separation.

Stresemann (1923, *Jour. Ornith.*, vol. 71, p. 365) separated a series

of specimens from the foothills of Omi (=Omei Shan), Szechwan, as *sinense*, which was stated to be more grayish, less greenish olive, on the upper parts and the flanks, and slightly smaller. Stresemann gives the wing length of six specimens as 45–49 (average 46.5) mm. I have examined two topotypical males of *sinense* in the American Museum of Natural History and found them identical in color with typical *olivaceum*. The wings measured 45, 47 mm. I measured the wing length of 10 males of typical *olivaceum* as 45–49 (average 47.0) mm. Consequently, *sinense* must be regarded a synonym of *olivaceum*.

The British Museum possesses a specimen of *olivaceum* from Nepal, collected by Hodgson, a female in very worn plumage, which is marked as the type of "*Myzanthus inornatus* Hodgson, 1833." This name was formerly often used as an earlier designation of *olivaceum*, but actually it is a *nomen nudum*, as has already been pointed out by Oates (1890, Fauna of British India, Birds, vol. 2, p. 380) and Hartert (1910, Novitates Zool., vol. 17, p. 243). Sharpe (1884, Proc. Zool. Soc. London, for 1883, p. 580) first drew attention to the identity of *olivaceum* Walden and Hodgson's specimen from Nepal. The "type" chosen by Sharpe does not, of course, provide a basis for Hodgson's *nomen nudum*, but it determines the species *Dicaeum inornatum* of Sharpe, who published the first valid description (1885, Catalogue of birds in the British Museum, vol. 10, p. 45).

Dicaeum concolor virescens Hume, 1873

TYPE LOCALITY: Port Blair, Andaman Islands.

Differs very strikingly from *olivaceum* in having the upper parts bright green, the throat and breast pale gray, and the abdomen lemon yellow, strongly contrasting with the pale gray color of the breast. Proportions as in *olivaceum*; wing length in males 46–49 mm. This form, restricted to the Andaman Islands, is very distinct. A series in the British Museum and two specimens in the American Museum of Natural History have been examined.

Dicaeum concolor minullum Swinhoe, 1870

TYPE LOCALITY: Hainan.

Differs from *olivaceum* in having the upper parts more bright green (but not so much so as in *virescens*), the throat, sides of head, ear coverts, and entire under parts, including flanks, strongly suffused with yellow, producing an almost uniform yellowish olive-green coloration. Very slightly smaller than *olivaceum*, the wing of four males measuring 45–47 (average 46.0) mm. This is the form of the Island of Hainan.

A good series in the American Museum of Natural History has been examined.

Dicaeum concolor uchidai Kuroda, 1920

TYPE LOCALITY: Formosa.

Very similar to *olivaceum*, but the upper parts are darker and more somber green. The wing length of the only male examined (in the American Museum of Natural History) is 48 mm.; the wing length of the type specimen is said to be 48.5 mm. Inhabits Formosa (Taiwan), where it frequents the temperate forests between 600 meters and 1500 meters (Hachisuka and Udagawa, 1951, Quart. Jour. Taiwan Mus., vol. 4, nos. 1-2, p. 22).

Dicaeum concolor borneanum Lönnberg, 1925

TYPE LOCALITY: Borneo.

Similar to *olivaceum*, but differs in having the upper parts distinctly more bright green, although not so much so as in *virescens*, the throat pure gray, without any olive tinge, the breast and abdomen slightly more gray than in *olivaceum*, and the flanks darker and colder grayish green. Proportions as in *olivaceum*.

This form inhabits the Malay States, where it has been recorded northward to Perak, but everywhere appears to be rare and local; it is found also on Sumatra, Borneo, and the Great Natuna Islands. It frequents rather open wooded areas in the lowlands and the submontane zone, to an altitude of about 800 meters (Malay States, Sumatra) or 1100 meters (Borneo). It is noteworthy that the huge area comprising peninsular Siam, Tenasserim (northward to Moulmein), all southern and central Siam (northward to about latitude 17° N.), and southern Indo-China (Cochin-China and Cambodia) is uninhabited by any form of *D. concolor* (cf. fig. 1).

A series from Borneo (including the type) and Sumatra and one specimen from Bunguran Island, Great Natuna Islands, have been examined in the British Museum and in the American Museum of Natural History.

This form has been discussed a few times previously. Robinson and Kloss (1919, Ibis, p. 623) stated that birds from the Malay States and from Sumatra averaged less gray and more ochraceous than ones from Annam, and Kinnear (1929, Ibis, p. 331) drew attention to the fact that birds from Penang were greener "both above and below" than typical *olivaceum*.

Dicaeum concolor sollicitans Hartert, 1901

TYPE LOCALITY: Java.

Similar to *borneanum*, but distinctly paler; crown and neck duller and paler green, mantle, back, and wing coverts bright green as in *borneanum*, but paler; under parts with a grayish tinge as in *borneanum*, but throughout paler; throat grayish white, flanks paler grayish green. The wing length in males is 44–47 mm. Inhabits Java and Bali, and has been recorded at altitudes up to 1500 meters. Large series in the British Museum, and a smaller one in the American Museum of Natural History, have been examined. Specimens from Java and Bali are exactly alike.

Dicaeum pygmaeum

This Philippine species differs from *erythrorhynchos* and *concolor* in possessing a marked sexual dimorphism. The females of the northern subspecies (*palawanorum* and nominate *pygmaeum*) are very similar to *concolor olivaceum*, differing only in having a strong olive-yellow tinge on the rump and upper tail coverts, contrasting with the greenish brown back and mantle. In body size and in structure and length of bill the two species match each other, *pygmaeum* being only slightly smaller on an average. The male differs strikingly from the female and in many respects resembles the female of *ignipectus*. Of the southern subspecies (*davao*) both sexes are much further advanced than are those of the northern ones, and the male as well as the female strikingly resembles the corresponding sex of *ignipectus*, even in details. As far as the males of *ignipectus* are concerned, the color of the throat and breast is scarlet, while in *davao* it is pale yellowish vinaceous, but some subspecies of *ignipectus* (*cambodianum* and *beccarii*) are very near to *davao* as regards the color of throat and breast.

The geographical variation within *pygmaeum* thus appears to bridge the differences between *concolor* and *ignipectus*, but the phylogenetic connection between the three species is difficult to understand. Ripley (1950, Condor, vol. 52, p. 165), who draws attention to the similarity between the males of *davao* and those of *ignipectus*, suggests that the sympatric occurrence of these two species in the Philippine Islands is due to double invasion by the Celebesian *celebicum*. This seems very unlikely, however, because *davao* and *ignipectus* are mutually much more similar than either of them is like *celebicum*. The theory, furthermore, does not explain the similarity between the northern forms of *pygmaeum* and the Malaysian *concolor*, which they represent geo-

graphically in Palawan and the northern Philippine Islands (see fig. 1).

Nominate *pygmaeum* inhabits dense forests and, according to Giliard (1950, Bull. Amer. Mus. Nat. Hist., vol. 94, p. 499), also second growth and open forest. As does *bicolor* it ranges from about sea level well up into the mountains and, in northern Luzon, has been recorded up to an altitude of about 1800 meters.

The material examined of this species includes 95 specimens, belonging to the American Museum of Natural History (25 specimens), Zoological Museum, Copenhagen (12), Chicago Natural History Museum (16), Carnegie Museum, Pittsburgh (six), United States National Museum (20), British Museum (Natural History) (five), Philippine National Museum, Manila (11).

Dicaeum pygmaeum palawanorum Hachisuka, 1926

TYPE LOCALITY: Palawan.

Differs from nominate *pygmaeum* in having the upper parts slightly paler greenish and with slightly less gloss, the under parts with a distinctly lighter yellowish tinge, and the flanks not so dark olive-green. These characters hold good in both sexes. In addition, *palawanorum* is slightly larger than nominate *pygmaeum* and has a longer bill. The bill length (measured from skull) is 12–13 mm. in males of *palawanorum*, compared with 10.8–11.2 mm. in males of nominate *pygmaeum*. The wing length in 10 adult males of *palawanorum* is 46–49 (average 47.4) mm., compared with 44–48 (average 45.5) mm. in 32 males of nominate *pygmaeum*. The difference in wing length is more pronounced than the measurements imply, as the figures given for *pygmaeum* are based on heterogeneous material, comprising birds even from great altitudes (the mountains of northern Luzon) and from small islands (such as Fuga), where the wing has a pronounced tendency to become longer. The usual wing-length variation in lowland populations of nominate *pygmaeum* is 44–46 mm., with an average of about 45.1–45.4 mm. This is shown in table 1, where the variation in wing length of the different island populations is given. A similar difference between the two subspecies is found in the females, as is also to be seen in table 1.

Dicaeum pygmaeum palawanorum inhabits the islands of Palawan and Balabac, but was not known previously from other islands. However, in the Philippine National Museum, Manila, there are two specimens from Culion Island, Calamianes Group, collected in 1947. The Culion specimens match exactly the Palawan specimens in coloration but appear to have slightly smaller measurements (see table 1).

Dicaeum pygmaeum pygmaeum (Kittlitz), 1833

TYPE LOCALITY: Luzon.

This form inhabits the Philippines proper, south to the Mindanao Sea and the Surigao Strait. It does not occur in the Batan Islands nor apparently on Panay either, for it has not yet been recorded there. It is the only species of flowerpecker occurring in the Babuyan Islands north of Luzon. The island of Cebu is usually not included in the range of *pygmaeum*, but McGregor (1910, A manual of Philippine birds, pt. 2, p. 634) mentions a female from there. The species is not mentioned in the recent list of Cebu birds by Rabor (1959, Auk, vol. 76, p. 37), and it has undoubtedly been exterminated now on this island, as have so many other forest birds.

As mentioned above, there is a slight geographical variation in body size in nominate *pygmaeum* (see table 1).

TABLE 1
WING MEASUREMENTS (IN MILLIMETERS) OF *Dicaeum pygmaeum*
(The means are given in parentheses.)

	Males	No. of Specimens	Females	No. of Specimens
Palawan	46-49 (47.4)	10	44-45 (44.4)	6
Culion	45	1	44	1
Fuga	47	1	—	—
Caleyan	—	—	46	1
Luzon ^a	45-48 (46.0)	15	42-44 (43.1)	14
Mindoro	44-46 (45.1)	4	42-44 (43.1)	4
Sibuyan			45.5	1
Masbate	45, 46.5	2	44	1
Negros	44-46 (45.4)	8	42-44 (43.3)	5
Siquijor			43	1
Samar	45	1	—	—
N. Mindanao	42-44 (43.2)	6	40-43 (41.5)	6
S. Mindanao	45.5, 45.5	2	—	—

^aMainly mountain specimens.

The population of the Babuyan Islands may constitute a slightly different subspecies. The birds from these islands (Fuga, Caleyan) are slightly larger than typical lowland *pygmaeum*, and the single male examined (in the Chicago Natural History Museum) had distinctly more gloss on the mantle and back, a deeper orange vinaceous tinge on the under parts, slightly darker olive flanks, and the dark longitudinal

patch on the center of the lower breast and abdomen more well marked and distinct than do males of typical *pygmaeum*.

Dicaeum pygmaeum davao Mearns, 1905

TYPE LOCALITY: Cotabato Province, Mindanao.

The male differs strikingly from that of the two subspecies mentioned above. The upper parts are uniform dark glossy bluish green, occasionally with olive-yellow tips to a few feathers on the rump, while in the other subspecies the upper parts are olive-green, with a dull gloss, and the rump and upper tail coverts are olive-yellow. The sides of the head and breast are black in *davao* (not cinereous), the longitudinal patch on the center of the abdomen is black and distinct, sharply contrasting with the light ground color (in the other subspecies cinereous, blurred, and ill defined), the under parts are suffused with darker yellow vinaceous, and the flanks are darker olive-green than those of *palawanorum* and nominate *pygmaeum*. The female is more glossy on the upper parts and slightly darker yellowish on the under parts than is that of the two other races. The sexual dimorphism is much more pronounced than in the other subspecies. The bill is the same length as that of nominate *pygmaeum*, but the wing is shorter, that of six males from northern Mindanao measuring 42–44 (average 43.2) mm.; of six females, 40–43 (average 41.5) mm.

This form, restricted to Mindanao, has hitherto been regarded as a very rare bird, and the female has not heretofore been described. Mearns collected one male in Cotabato Province and another in Davao Province, and Celestino collected one male in Agusan Province. Hachisuka collected two males and one female in Davao and Cotabato, but neither he (Hachisuka, 1941, *Tori*, vol. 11, nos. 51–52, p. 86) nor Ripley (1950, *Condor*, vol. 52, p. 165), who commented on the Hachisuka collection, described the female collected, which was the only one known. During the Danish Philippine Expedition of 1951–1952, which worked in northern Mindanao, we found that *davao* differed considerably in habitat selection from the other subspecies, having adjusted itself to a quite peculiar ecological niche. It was not a forest bird, but was dependent on the presence of water, frequenting riverine thickets, edges of inundated forests, and mangroves, evidently preferring flooded tree groups, in which it was found to be rather common. It was definitely a lowland and submontane bird, and we never found it above the upper limit of the dipterocarp forests at an altitude of about 1200 meters. A total of six adult males and six adult females were collected in the provinces of Surigao, Agusan, Misamis Oriental,

and Bukidnon. The measurements of these specimens are given in table 1. The wing length of this population is the smallest attained by any member of the family Dicaeidae. The wing length of the two males collected by Mearns in southern Mindanao, measured by me, is slightly greater (see table 1), which may indicate a possible geographical variation.

There is no representative of *pygmaeum* on the island of Dinagat, in the Sulu Islands, and on Basilan, and I am quite sure that the species also does not occur in the western peninsula of Mindanao (the provinces Zamboanga and Misamis Occidental). In spite of the fact that Zamboanga is the best known part of Mindanao and has been visited by a great number of ornithological collectors, *pygmaeum* has never been recorded there, even by the recent expeditions of Rabor of Silliman University.

The striking difference in color pattern as well as in ecology between nominate *pygmaeum* and *davao* may indicate that the latter should be treated as a full species.

Dicaeum nehrkorni Blasius, 1886

TYPE LOCALITY: Celebes.

The remaining species of the genus *Dicaeum* form a complicated assemblage of closely related and very similar species. With the exception of the aberrant *tristrami*, they all display a pronounced sexual dimorphism, the plumage of the males being supplied with much red, that of the females with less, or entirely lacking this color. The inter-relationship between these species is not easy to determine, and the taxonomy has been the subject of much discussion. Mayr and Amadon (1947, Amer. Mus. Novitates, no. 1360, pp. 19-29) in their review of the Dicaeidae have contributed considerably to the understanding of the phylogeny and classification of these puzzling species. I agree with Mayr and Amadon in their evolutionary and phylogenetic interpretations, and I differ only slightly from them in the systematic treatment.

Mayr and Amadon arrange the species in question in two groups, namely, the *cruentatum* group and the *hirundinaceum* group, of which the latter forms a single superspecies, while the former is more complex, consisting of more heterogeneous units. Obviously, the arrangement within the two mentioned groups is not entirely satisfactory. I prefer the following grouping, which appears to be not so arbitrary:

1. The superspecies *erythrothorax*, with the species *nehrkorni*, *vulneratum*, *erythrothorax*, *pectorale*, *eximium*, and *aeneum*. I consider *pectorale* and *geelvinkianum* as conspecific. *Dicaeum tristrami* has de-

viated too much to be treated as a member of the superspecies, but for geographical reasons it should be placed near *aeneum*.

2. The closely allied and exceedingly similar species *igniferum*, *maugei*, *sanguinolentum*, *hirundinaceum*, *celebicum*, *montanum*, and *ignipectus*, of which the five last-named species form one superspecies (*hirundinaceum*).

3. The two closely allied species *cruentatum* and *trochileum*, which, judging from the color pattern, have reached a somewhat higher evolutionary stage than the above-mentioned species and therefore are treated as the last in the series. The close relationship between this and the preceding group is demonstrated by the fact that *cruentatum* is able to hybridize not only with *trochileum* but also with *ignipectus* in areas where the ranges of these species overlap.

My ideas about the evolutionary history of these species differ only in minor details from those put forward by Mayr and Amadon (*loc. cit.*), but matters are very complicated, and I am sure that the last word has not been said on this subject.

Dicaeum nehrkorni from Celebes and *igniferum* from the Lesser Sunda Islands can be termed "key species," because they combine characters common to several species. These two species are rather closely allied, and, judging from morphology and geographical range, they appear to represent the oldest elements of the whole group. The male of *nehrkorni* is characterized by its red crown patch, red rump, minute red spot on the center of the breast, gray throat, blackish longitudinal patch on the lower abdomen, and dull, glossy, bluish black upper parts and wings.

The combination "red crown and red rump" is found also in *igniferum*, evidence of the close relation between this species and *nehrkorni*, but is absent in all other species of groups 1 and 2, except that it recurs secondarily in the distant *geelvinkianum* group of *pectorale*. There is a primary difference between the two characters "red crown" and "red rump." In all evolutionary trends characterized by loss of red, the "red crown" is invariably lost before the "red rump." This is the case in the series *nehrkorni-vulneratum-erythrothorax*, in (*pectorale*) *geelvinkianum-eximium-aeneum*, and in *igniferum-maugei-sanguinolentum*.

The smallish red spot on the mid-breast of *nehrkorni* indicates the first development towards the striking carmine or scarlet breast patch found in all other species of groups 1 and 2, except in the aberrant *tristrami*. It is invariably sex-linked, restricted to the males.

The blackish longitudinal patch on the under parts of *nehrkorni* is

homologous with the similar pattern in *pygmaeum davao* and is common to all species of group 2. This character is absent in the species of group 1, except that it is vaguely defined in *eximium*.

The glossy coloration on the upper parts and wings of *nehrkorni* has been lost in all the neighboring species within the superspecies *erythrothorax*, but reappears in the *geelvinkianum* group of *pectorale* and in *aeneum* and, furthermore, is present in all species belonging to group 2, although widely differing in luster.

Finally, the gray throat in *nehrkorni* is exactly similar to that found in *cruentatum sumatranum*, *vulneratum*, and *erythrothorax schistaceiceps*.

It is evident from what is specified above that *nehrkorni* links group 1 with group 2 and group 3. This species is undoubtedly nearest the ancestral form of the superspecies *erythrothorax*, which from Celebes has spread eastward to New Guinea and Melanesia. According to morphological characters and geographical distribution, *nehrkorni*, *vulneratum*, *erythrothorax erythrothorax*, *erythrothorax schistaceiceps*, *pectorale pectorale*, *pectorale geelvinkianum* (and allied subspecies), and *eximium* and *aeneum*, respectively, represent successive evolutionary steps. I follow Mayr and Amadon (*loc. cit.*) in uniting all these forms in one superspecies (*erythrothorax*). In many respects *nehrkorni* is closer to *igniferum* than it is to the members of the superspecies *erythrothorax* and consequently had better be removed from this assemblage. This is a matter of taste, however, and is not important. *Dicaeum igniferum* shows all the earmarks of having reached a higher evolutionary stage than *nehrkorni*, having acquired the fully developed, complicated ventral color pattern of all species within group 2. This tends to show that *nehrkorni* has a very central position in the system, standing nearest the ancestral stock from which not only the superspecies *erythrothorax* but even the remaining species (groups 2 and 3) have radiated.

Dicaeum igniferum has given rise to two lines of development, as already pointed out by Mayr and Amadon (*loc. cit.*). The first was a westward radiation, which gave rise to the development of species with an intensification of the red color (*cruentatum*, *trochileum*), but possibly these species are more closely related to *nehrkorni*. The second, and probably more recent, line of development was a radiation in several directions, with a subsequent formation of species showing a loss of the red color (*maugei* and the superspecies *hirundinaceum*). This second radiation was rather complicated, involving several inter-island crossings, with subsequent speciation. This will be dealt with further in a later paper.

The bill form of all the species belonging to groups 1, 2, and 3 is remarkably uniform. The bill is invariably short, and in most species is fine and attenuated, as in *pygmaeum*, although hardly so curved, being straighter. The finest and most pointed bill is found in *cruentatum* and *trochileum*. In *erythrothorax*, the *geelvinkianum* group of *pectorale*, *maugei*, and *hirundinaceum*, the bill is slightly thicker and stronger than the average, but still short and slender, and in *eximium* and some subspecies of *sanguinolentum*, such as *s. wilhelminae*, the bill is still slightly heavier. In *aeneum* the bill is somewhat longer than in the other species. Only *tristrami* differs considerably in the form of the bill. In this aberrant species the bill is thick and blunt, like that of a finch, somewhat resembling that of *Prionochilus*.

Dicaeum nehrkorni is restricted to Celebes, where it inhabits the mountain forests between an altitude of about 800 meters and 2000 meters. I have examined a very large series in the American Museum of Natural History.

The description of this species is often credited to Hartert (1896, *Novitates Zool.*, vol. 3, p. 151), but this author added to his description the statement that *nehrkorni* had never before been described in a scientific journal and that it had been originally described by Blasius in the newspaper *Braunschweigischer Anzeiger*. Some authorities quote "Blasius, 1886, *Jour. Ornith.*, vol. 34, p. 399" as the original description, but this is a reference to a paper by Schalow in which *nehrkorni* appears as a *nomen nudum* only. The correct quotation is "Blasius, 1886 (March 3), *Braunschweigischer Anzeiger*."

Dicaeum vulneratum Wallace, 1863

TYPE LOCALITY: Seram.

This species, restricted to Seram and Ambon and a number of adjacent small islands, differs strikingly from *nehrkorni* in having lost most of the "key characters" of the latter species, including the red crown patch, the blackish ventral longitudinal patch, and the glossy color of the upper parts. The rump is still red in both sexes, and the pectoral red patch in the male is considerably larger, being similar to that of all the following species. The remaining under parts are almost uniform slaty gray, while the upper parts are brown.

This species appears to frequent the mid-mountain zone in Seram, being common at altitudes between 300 meters and 600 meters, but has been recorded up to 2100 meters.

Small series in the American Museum of Natural History and in the British Museum (Natural History), including the type specimen, were examined.

Dicaeum erythrothorax

This Moluccan species differs from *vulneratum* in having lost even the red color of the rump (in both sexes). The head is slaty gray, the upper parts are olive greenish, and the flanks and abdomen are olive yellowish. In its coloration it is far removed from *nehrkorni* and has a much more "primitive" appearance. Because, according to the theory set forth above, its specific characters have been produced mainly by successive losses of bright color patches, it might be argued that the evolution could as well have taken place in the opposite direction, from the "primitive" *erythrothorax* via *vulneratum* to *nehrkorni* in connection with a successive acquirement of contrasting color patches. If this had been the case, however, it would be difficult to explain how *nehrkorni* and the New Guinea *geelvinkianum* group could be so similar in color pattern. It would have required a parallel development in the population which spread to the west (to Celebes) and in that which went to the east (to New Guinea) from the original range in the Moluccas. Such a development is very unlikely, although of course not impossible. If *nehrkorni* in Celebes be accepted as the original center of the superspecies, it is possible to explain the evolution also on the assumption that the characters in question were lost in the Moluccan forms, in which, however, the genetic pattern did not exclude the possibility of their regaining them, to the extent that they manifested themselves in the phenotype of the New Guinea forms.

Mayr and Amadon (*loc. cit.*) discuss the fact that *vulneratum*, which is closest to the Celebes *nehrkorni* in appearance, occurs on Seram, while the much more different *erythrothorax* inhabits not only the northern Moluccas, but also Buru, which is situated between Celebes and Seram. These authors furnish the explanation that *erythrothorax* "recently spread south to Buru where *vulneratum* for some reason was absent." It is more plausible to assume that the entire Moluccan region originally was inhabited by a single form, nearest *vulneratum*, and that the characters proper to *erythrothorax* developed in a period when the connection with Seram was already lost.

Dicaeum erythrothorax appears to prefer the lowlands, contrary to the habits of *nehrkorni* and *vulneratum*. In Buru it is found from sea level to an altitude of, at most, 800 meters (Stresemann, 1914, *Novitates Zool.*, vol. 21, p. 395). There are two distinct subspecies.

Dicaeum erythrothorax erythrothorax Lesson, 1828

TYPE LOCALITY: BURU.

The nominate form is restricted to the island of Buru. It differs from *erythrothorax schistaceiceps* in having the chin and the center of the

throat pure white, sharply contrasting with the dark, slate-colored sides of the throat and breast, while in *schistaceiceps* the chin and throat are uniform slaty gray. In addition, the wing coverts and remiges have broad olive-green edges on the outer webs, while in *schistaceiceps* the wings are almost uniform dark brown, virtually without greenish edges.

The material in the American Museum of Natural History and the British Museum (Natural History) has been examined.

Dicaeum erythrorhox schistaceiceps G. R. Gray, 1860

TYPE LOCALITY: Batjan and Halmahera.

Inhabits Obi, Batjan, Halmahera, and Morotai. Mayr and Amadon (*loc. cit.*) hold it to be absent on Halmahera, but Van Bemmelen (1948, *Treubia*, vol. 19, p. 332) includes this island in the range of *schistaceiceps*, and there is at least one recent record from Halmahera, viz., a female collected by G. Heinrich in 1931 (in the American Museum of Natural History, examined by me, but received from the Berlin Museum only a year or two ago).

According to the available rather scanty material, in the American Museum of Natural History and the British Museum, there is a slight difference between the specimens from Morotai and those from the other islands. The former are slightly duller, particularly on the flanks, which are grayish olive, not bright olive-green. I have examined a male and a female in the American Museum of Natural History and a male in the British Museum, and I am sure that it would be possible, by means of a larger series, to demonstrate that the Morotai birds form a recognizable subspecies. Unfortunately there are no specimens from Morotai in the Leiden Museum (G. C. A. Junge, *in litt.*), and the above-mentioned three specimens are probably the only ones extant. Hartert (1903, *Novitates Zool.*, vol. 10, p. 55), who examined the two specimens now in the American Museum of Natural History, has already drawn attention to the differences between the birds from Morotai and those from the other islands.

Dicaeum pectorale

The species of *Dicaeum* occurring in the New Guinea area are allopatric, but are usually regarded as three full species, namely, *pectorale*, *geelvinkianum*, and *nitidum*. Mayr (1941, *List of New Guinea birds*, pp. 212-213) treated them in this way, but a few years later Mayr and Amadon (1947, *Amer. Mus. Novitates*, no. 1360, p. 21) considered *geelvinkianum* and *nitidum* as being conspecific, but kept *pectorale*

apart. However, many years previously Stresemann (1923, Arch. Naturgesch., vol. 89, div. A, no. 7, pp. 66-67) suggested that the three New Guinea species in question should be united into one species, to which he even attached *erythrothorax*. The recent discovery of the subspecies *obscurifrons*, which forms an almost exact intermediate between *pectorale* and *geelvinkianum*, removes all doubt about the conspecificity of the two species. It is practical, however, to separate two subspecies groups, the *pectorale* group, comprising nominate *pectorale* only, and the *geelvinkianum* group, with 13 subspecies.

Dicaeum pectorale frequents the forest and the second growth in the lowlands as well as in the mountains, in which it ascends to altitudes of about 1500 meters (Arfak Mountains, Sepik Mountains), 1600 meters (Snow Mountains), 1750 meters (Wissel Lake area), 1800 meters (southeastern peninsula), and 2000 meters (Central Highlands).

Pectorale GROUP

Similar to *erythrothorax*, differing mainly in having the upper parts, including the head, uniform olive-green, while in *erythrothorax* the head is slate-colored. The breast, flanks, and abdomen are uniform dark olive grayish, while in *erythrothorax* the breast is slate-colored and the abdomen and flanks are olive yellowish. The *pectorale* group resembles nominate *erythrothorax* in having the chin and central throat white, but resembles the subspecies *schistaceiceps* in the coloration of the wing.

Dicaeum pectorale pectorale S. Müller, 1843

TYPE LOCALITY: Triton Bay, western New Guinea.

This is the form of the Western Papuan Islands and western New Guinea, eastward to the head of Geelvink Bay, to the Weyland Mountains, and to Triton Bay. I have examined a large number of specimens from various museums and could find no geographical variation in color, except that the birds from Waigeu Island are slightly paler on the under parts, especially noticeable in the females. However, an adult male from Wasior, Wandammen Peninsula, had a faint rusty tinge on the crown, but two other males from this locality did not differ from the normal type. The single male examined from the Weyland Mountains had the crown slightly more olive-brown than do birds from other localities. These instances may indicate the very first beginning of influence from the eastern *geelvinkianum* group.

There is a slight variation in wing length, and Gyldenstolpe (1955, Ark. Zool., ser. 2, vol. 8, no. 2, p. 331) has recently drawn attention to

the fact that specimens from the Wandammen Peninsula appear to be slightly larger than those from other localities. I have measured the wing length in a total of 33 specimens, belonging to the American Museum of Natural History (nine specimens), Zoological Museum, Berlin (10), British Museum (Natural History) (three), and Naturhistoriska Riksmuseet, Stockholm (11). The measurements are given in table 2.

TABLE 2
WING MEASUREMENTS (IN MILLIMETERS) OF *Dicaeum pectorale pectorale*

	Males	Females
Salawatti	52	
Waigeu	49, 50, 50, 50, 51, 51	45, 46, 46, 47
Mysol	52.5	
Wasior, Wandammen Peninsula	52, 52, 53	48.5
Ron Island	55	
Sorong, Vogelkop Peninsula	50	
Atinju, Vogelkop Peninsula	50.5	
Manokwari, Vogelkop Peninsula	53, 54, 55	48, 48.5
Arfak Mountains	53, 54	48.5
Adi Island	51, 51, 51	47, 47
Weyland Mountains	53	

It is clearly to be seen in the table that the variation in wing length is insignificant and does not follow any geographical pattern; the Waigeu birds apparently have the shortest wings. Some additional measurements of wing length have been given by Mayr and De Schauensee (1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 91, pp. 143, 163), viz., three males from the lowlands of northern Vogelkop Peninsula, 50 (worn), 51, 54 mm.; three females from the same area, 44.5, 46, 47 mm.; one male from Batanta Island, 50.5 mm. These measurements correspond with those given in table 2.

Geelvinkianum GROUP

Differs strikingly from *pectorale* in having the crown and rump red, contrasting with the remaining upper parts, which are more or less glossy. The females differ in a similar way from those of *pectorale*, but the coloration of the upper parts is much duller than in the males. Obviously, the color pattern of the *geelvinkianum* group means a reversion to the characters of *nehrkorni*.

There is a very pronounced geographical variation, and a large number of subspecies can be recognized. The forms adjacent to *pectorale*

constitute transitional links between this subspecies and the more eastern "true" *geelvinkianum*, having the red color of the crown and rump only faintly indicated and being virtually without gloss on the upper parts, in this way holding an intermediate position or being even nearer to *pectorale* than to the eastern forms of *geelvinkianum*. From these transitional forms (*maforense*, *misorien*se, nominate *geelvinkianum*, and *obscurifrons*) a marked trend runs towards the east, resulting in a gradual increase in the intensity of the carmine color of the crown and rump, in the gloss on the upper parts and even in the extension of the red pectoral patch. The geographical variation in the *geelvinkianum* group has been dealt with mainly by Salvadori (1881, *Ornitologia della Papuasias e delle Molucche*, vol. 2, p. 275), Rothschild and Hartert (1903, *Novitates Zool.*, vol. 10, p. 214), Stresemann (1923, *Arch. Naturgesch.*, vol. 89, div. A, no. 7, p. 66), and Rand (1938, *Amer. Mus. Novitates*, no. 991, p. 14; 1941, *ibid.*, no. 1102, p. 14). The range of the different subspecies is given in figure 2.

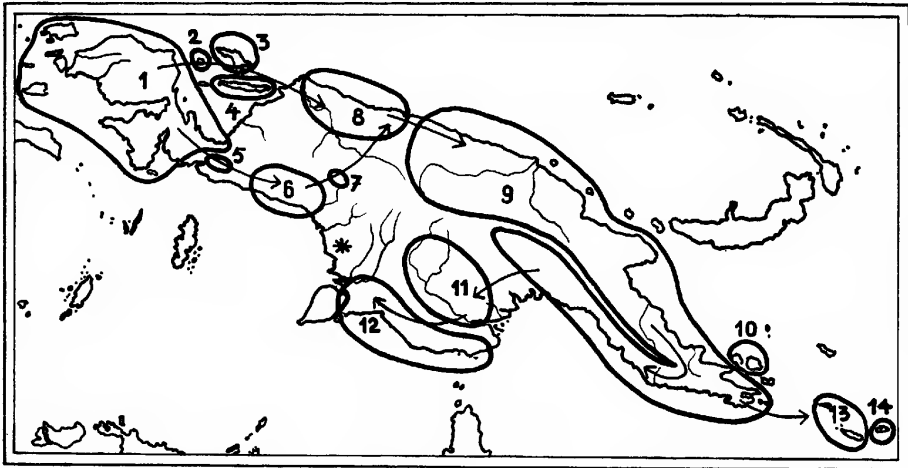


FIG. 2. The distribution of *Dicaeum pectorale*: 1, *pectorale*; 2, *maforense*; 3, *misorien*se; 4, *geelvinkianum*; 5, *obscurifrons*; 6, *setekwa*; 7, *centrale*; 8, *diversum*; 9, *rubrocoronatum*; 10, *violaceum*; 11, *rubrigulare*; 12, *albopunctatum*; 13, *nitidum*; 14, *rosseli*. Arrows indicate the probable routes of dispersal. The asterisk marks the area in which a hybrid zone between *setekwa* and *albopunctatum* must be expected to occur.

Dicaeum pectorale maforense Salvadori, 1876

TYPE LOCALITY: Numfor Island.

The under parts in the adult male are similar to those of *pectorale*; the upper parts are olive-green, as in *pectorale*, but differ in having a

glossy bluish veil; the crown and the rump are dull and somber brownish red. The female is similar to that of *pectorale*, but has a chestnut brown crown and rump. The proportions are like those of *pectorale*.

This form, which of all subspecies within the *geelvinkianum* group is nearest to *pectorale*, is restricted to Numfor Island in Geelvink Bay. A long series has been examined in the American Museum of Natural History.

Dicaeum pectorale misoriense Salvadori, 1876

TYPE LOCALITY: Biak Island.

Differs from *maforense* in being slightly more dull, not so bright greenish on the upper parts, paler grayish green on the under parts, with the red pectoral patch distinctly smaller, and in having the rump bright carmine, while the crown is of the same dull brownish red as that of *maforense*. The type specimen and one more male have been examined in the American Museum of Natural History. This form is found only on Biak Island in Geelvink Bay, where it has been recorded up to an altitude of 600 meters (Mayr and De Schauensee, 1939, Proc. Acad. Nat. Sci. Philadelphia, vol. 91, p. 36).

Dicaeum pectorale geelvinkianum A. B. Meyer, 1874

TYPE LOCALITY: Japan Island.

Similar to *maforense*, but both crown and rump carmine red, not dull brownish red, and the red pectoral patch reduced in size, as in *misoriense*. Restricted to the islands of Japan and Kurudu in Geelvink Bay. A long series in the American Museum of Natural History has been examined. The species is apparently missing from Meos Num Island in Geelvink Bay.

A. B. Meyer (1874, Sitzungsber. K. Akad. Wiss. Wien, vol. 70, div. 1, p. 120) gave the range of his new species *Dicaeum geelvinkianum* as "Jobi, Mysore and Mafoor." Salvadori (*loc. cit.*) therefore placed *geelvinkianum* as a partial synonym of his three species, *jobiense*, *mysoriense*, and *maforense*, and did not restrict the type locality of *geelvinkianum*. As this name has priority over all three names given by Salvadori, it cannot, naturally, be ignored. According to Ogilvie-Grant (1915, Ibis, Jubilee Suppl., no. 2, p. 82) the type of *geelvinkianum* came from Japan; as a matter of fact, all restrictions of type locality have been made to that island, at first, I think, by Sharpe (1885, Catalogue of the birds in the British Museum, vol. 10, p. 34). *Dicaeum jobiense* Salvadori consequently becomes a synonym of *geelvinkianum*.

Dicaeum pectorale obscurifrons Junge, 1952

TYPE LOCALITY: Wissel Lake district.

Very similar to *maforense* in coloration, but the pectoral patch in the male is carmine red, while it is not so intensely colored, more brick-red, in *maforense* as well as in *misoriense*, *geelvinkianum*, and *pectorale*. In addition, the proportions are considerably larger. The wing length of three males measures 56–59 (average 57.3) mm., compared with 50–53 mm. in the above-mentioned subspecies, which are of equal size.

Dicaeum pectorale obscurifrons is found in the Wissel Lake district, situated in the mountainous hinterland of Etna Bay, at an altitude of about 1750 meters, i.e., sandwiched between *pectorale pectorale* and *pectorale setekwa*. It forms a perfect intermediate between these two subspecies (apart from body proportions) and probably grades into one or both of them. It agrees with *pectorale* in the color of the under parts and approaches it in the dull brownish red color on the crown and rump and the greenish, only slightly glossy, upper parts. The more advanced forms of the *geelvinkianum* group, dealt with below, differ markedly in having a bright red crown and rump, more gloss on the upper parts, and a paler, more yellowish breast and abdomen, contrasting with the olivaceous flanks.

Thanks to the courtesy of Dr. G. C. A. Junge, I have been able to examine three topotypical specimens (two males, one female) of *obscurifrons*, belonging to the Leiden Museum. Another topotypical male was examined in Naturhistoriska Riksmuseet, Stockholm.

Dicaeum pectorale setekwa Rand, 1941

TYPE LOCALITY: Setekwa River, Nassau Range.

Nearest to *geelvinkianum*, from which it differs mainly in having the olive-green upper parts tinged with a much stronger bluish gloss, and the under parts distinctly paler, with a yellowish tinge. In addition, the red color of the crown and rump is still more intensely carmine, and the red pectoral patch is slightly larger, but not so large as in *maforense* and *obscurifrons*. The wings of adult males measure 50–53 mm. The females are similar to those of *geelvinkianum*, but the under parts are paler and more yellowish. This is the form of the southern slopes of the Snow Mountains, recorded eastward to the Noord River, found up to an altitude of 900 meters. Large series in the American Museum of Natural History and the British Museum (Natural History) have been examined.

Dicaeum pectorale centrale Rand, 1941

TYPE LOCALITY: Balim River, Snow Mountains.

Slightly darker than *setekwa*, on both upper parts and under parts, and with much larger proportions. The wing length of eight adult males measures 57–59 (average 57.9) mm. In coloration it is almost intermediate between *setekwa* and *diversum*.

This is a mountain form, as is *obscurifrons*, and inhabits the Balim River Valley on the southern slopes of the Snow Mountains, at an altitude of 1600 meters. It is probably isolated from the lowland form *setekwa*, as it has not been found in the adjacent areas, which have been explored by the Second and Third Netherlands South New Guinea Expeditions (cf. Junge, 1939, *Nova Guinea*, new ser., vol. 3, p. 48). I have examined Rand's original series, including the type, in the American Museum of Natural History.

Dicaeum pectorale diversum Rothschild and Hartert, 1903

TYPE LOCALITY: Lower Mamberano River, northern New Guinea.

Differs from *setekwa* in having the upper parts distinctly darker, glossy steel-blue, without any olive-green color, the under parts darker olive grayish green, and the crown, rump, and pectoral patch still more intense carmine. The proportions are similar to those of *setekwa*, the wing length of adult males being 50–54 mm. This form is distributed between the Mamberano River and Humboldt Bay in northern New Guinea and has been recorded up to an altitude of 950 meters.

It has already been pointed out by Rand (1941, *Amer. Mus. Novitates*, no. 1102, p. 15) that *pectorale simillimum* Hartert, 1930, type locality Hollandia, is a synonym of *diversum*. I have examined the large series in the American Museum of Natural History, including the types of both *diversum* and *simillimum*.

Dicaeum pectorale rubrocoronatum Sharpe, 1876

TYPE LOCALITY: Port Moresby.

Very similar to *diversum*, but the upper parts darker, with stronger gloss, tending towards bluish purple, the crown and rump with still more intense scarlet red color, and the under parts darker, more olive greenish.

This form is distributed in southeastern New Guinea, ranging westward north of the watershed to the upper Sepik River, and south of the watershed to the Purari River and the Central Highlands; it occurs also on the islands of Karkar and Manam off the north coast of

New Guinea. It is found from sea level up to about 1500 meters in the Sepik Mountains (Hunsteinspitze) and to about 2000 meters in the Central Highlands. The populations of this huge area display some geographical variation, which has been discussed mainly by Rothschild and Hartert (*loc. cit.*), Stresemann (*loc. cit.*), Mayr (1931, Mitt. Zool. Mus. Berlin, vol. 17, p. 667), and Mayr and Gilliard (1954, Bull. Amer. Mus. Nat. Hist., vol. 103, p. 370), but it does not appear to be advisable to separate any more subspecies. The variation involves the color of the upper parts and under parts, the length of the bill, and the general proportions, but the variation is generally patchy, without any marked geographical trend. The smallest bill is found, apparently, in the populations of the Hydrographer Range and of Karkar Island. The variation in wing length is pronounced and may be correlated with altitude. The population of the Sepik area has a wing length measuring (in adult males) 50–55 mm., according to Stresemann (*loc. cit.*). The length of the wing in the populations of the southeastern peninsula is similar, according to the measurements taken by me. The birds from the Sattelberg and Saruwaged Mountains in the Huon Peninsula are bigger, however, according to Stresemann (*loc. cit.*) and Mayr (*loc. cit.*), and the same is true of those inhabiting the Central Highlands, in which the body size is of the same magnitude as that of the mountain forms *obscurifrons* and *centrale*. The wing length of five males from the Wahgi region (three in the American Museum of Natural History, two in Naturhistoriska Riksmuseet, Stockholm) measures 55–60 (average 56.8) mm.

I have examined very large series of this subspecies in various museums, including the type specimen (in the British Museum).

Dicaeum pectorale violaceum Mayr, 1936

TYPE LOCALITY: Goodenough Island.

Similar to *rubrocoronatum*, but the gloss of the upper parts duller and more violet-purple, the red color of the crown, rump, and pectoral patch slightly darker, the under parts slightly paler, more grayish, and the chin and middle part of throat washed with grayish, not being so contrastingly whitish. This is the form of the D'Entrecasteaux Archipelago, but some birds from the north coast of the southeastern peninsula of New Guinea (Hydrographer Range) tend towards *violaceum*. Mayr's original series, including the type specimen, has been examined in the American Museum of Natural History.

Dicaeum pectorale rubrigulare D'Albertis and Salvadori, 1879

TYPE LOCALITY: Fly River.

Differs distinctly from *rubrocoronatum* in having the red pectoral patch in the male much larger, extending onto the sides of the breast and onto the throat. The red color of the crown, rump, and pectoral patch is lighter and brighter. Proportions as in *rubrocoronatum*; wing length of males 50–53 mm. This form is distributed in the Fly River district of southern New Guinea, from Palmer Junction to the mouth. A long series of this excellent form has been examined in the American Museum of Natural History.

Dicaeum pectorale albopunctatum D'Albertis and Salvadori, 1879

TYPE LOCALITY: Katau River, southern New Guinea.

Similar to *rubrigulare*, but the red pectoral patch still larger, covering also the entire throat and chin. In addition, the under parts are slightly paler, and the proportions are larger, on an average, the wing length in males being 51–56 mm.

This form, which merges into *rubrigulare* along the middle part of the Fly River, is found in the lowlands of southern New Guinea, where it has been recorded as far west as the Digul River. A series of about 30 specimens has been examined in the American Museum of Natural History.

This is the most advanced form of all the New Guinea subspecies. The evolutionary trend from the primitive nominate *pectorale* can easily be followed through the populations of the Geelvink Bay area, eastward through *setekwa-diversum* into *rubrocoronatum*, and then, in the southeastern peninsula, turning westward south of the watershed into *rubrigulare-albopunctatum*. This trend has been indicated by arrows in figure 2. No collecting has been done in the area between the Noord River and the Digul River (marked by an asterisk in fig. 2), but somewhere in this area the very different *setekwa* and *albopunctatum* undoubtedly must meet and probably produce a hybrid zone.

Dicaeum pectorale nitidum Tristram, 1889

TYPE LOCALITY: Tagula Island.

Nearest to *rubrocoronatum*, but strikingly different in having a bright metallic green gloss on the upper parts, crown patch dull and somber reddish maroon, pectoral red patch of greater extent, approaching that in *rubrigulare*, under parts bright olive-green, much darker than in any other subspecies, and, finally, in having larger proportions. The wing length in males is 55–58 mm.

This form inhabits the islands of Tagula and Misima in the Louisiade Archipelago. The birds from Misima have paler under parts than those from Tagula, but the difference is too slight to give rise to subspecific separation. Good series from both islands in the American Museum of Natural History, as well as the type specimen in the British Museum (Natural History), have been examined.

Dicaeum pectorale rosseli Rothschild and Hartert, 1914

TYPE LOCALITY: Rossel Island.

Differs from *nitidum* in having the crown still more dull and not so dark maroon, the upper parts lighter green and not so glossy, the under parts paler, more olive brownish, and larger proportions, including a much larger bill. The wing length in adult males is 60–61 mm. Restricted to Rossel Island, Louisiade Archipelago. A series, including the type, has been examined in the American Museum of Natural History.

Dicaeum eximium

This species, inhabiting the New Britain Archipelago, has a short, blunt bill, and is in coloration utterly different from the neighboring *geelvinkianum* group of *pectorale* in New Guinea. The upper parts in the males are brownish, without gloss, the rump is bright red, but the crown is dull maroon in nominate *eximium*, while in *layardorum* it does not differ in color from the remaining upper parts. The entire throat, not only the middle part, is white, the pectoral red patch is small, and along the middle of the lower breast and abdomen there is a longitudinal, slate-colored, indistinct streak. The females are duller than the males and lack the red pectoral patch and the longitudinal abdominal streak. Although clearly an offshoot of the *geelvinkianum* group, *eximium* in its color pattern possesses elements present in *nehrkorni*, *vulneratum*, and *pectorale pectorale*. The geographical variation within this species has been dealt with mainly by Hartert (1924, *Novitates Zool.*, vol. 31, p. 211; 1926, *ibid.*, vol. 33, p. 143). The American Museum of Natural History possesses long series of both subspecies.

Dicaeum eximium layardorum Salvadori, 1880

TYPE LOCALITY: New Britain.

This form is found on New Britain and the neighboring small island of Vuatom.

Dicaeum eximium eximium Sclater, 1877

TYPE LOCALITY: New Ireland.

Differs from *layardorum* in having the crown maroon, contrasting in color with the back. This latter is more olivaceous than in *layardorum*, not so brownish. This is the form of New Ireland and New Hanover. I have examined series from both these islands and can find no differences between them.

Dicaeum aeneum

This species, distributed in the Solomon Archipelago, has lost the red color of the crown as well as of the rump (in both sexes), but, contrary to *eximium*, it has the upper parts glossy. It has an extraordinary resemblance to *erythrothorax erythrothorax*, except that the latter has the back and rump greenish, without gloss. I agree with Mayr and Amadon (1947, Amer. Mus. Novitates, no. 1360, p. 20) that *eximium* and *aeneum* have evolved independently of each other, through separate invasions by the *geelvinkianum* group, *aeneum* probably originating from one of the forms inhabiting the Louisiade Archipelago (*nitidum* or *rosseli*).

Dicaeum aeneum is distributed over the main chain of the Solomon Islands, from Buka and Bougainville eastward to Guadalcanal and Malaita. San Christobal is inhabited by *tristrami*, while the family of the flowerpeckers is unrepresented in any other islands within the Solomons. *Dicaeum aenum* is a common bird at all altitudes and in all habitats, and enormous series (a total of about 200 specimens) were collected by the Whitney South Sea Expedition, now in the American Museum of Natural History, where I have examined them. In addition, I have studied the collection in the British Museum (Natural History) (15 specimens). There is some geographical variation in coloration, in wing length, and, particularly, in the length and form of the bill. The measurements taken by me are given for each island in tables 3 and 4.

Dicaeum aeneum aeneum Pucheran, 1853

TYPE LOCALITY: San Jorge, near Santa Isabel.

This is the form of the islands of Buka, Bougainville, Fauro, Choiseul, Santa Isabel, Florida, and Tulagi. The last two rather small islands are situated almost exactly between Santa Isabel, Malaita, and Guadalcanal, each of which is inhabited by a different subspecies. The coloration and the proportions of the populations of Florida and

Tulagi are similar to those of the Santa Isabel race (nominate *aeneum*), while the comparatively long and slender bill tends towards the Malaita subspecies (cf. table 4).

The name *Dicaeum aeneum* is usually credited to Jacquinot and Pucheran, but Mathews (1925, The birds of Australia, suppl. 4-5, Bibliography, p. 109) gives good reasons for assuming that Pucheran was the sole author of the volume in which *aeneum* was described.

Dicaeum aeneum becki Hartert, 1929

TYPE LOCALITY: Guadalcanal.

Very similar to nominate *aeneum*, but upper parts with a distinctly more greenish, not so bluish, gloss, flanks slightly darker olive greenish brown, bill slightly heavier, but not of greater length; wings on an average slightly longer.

Hartert (1929, Amer. Mus. Novitates, no. 364, p. 9) based his separation of this slightly different form mainly on its alleged greater proportions, stating that the wing length in males was 52-54 mm., compared with 49-52 mm. in nominate *aeneum*. The difference is, however, trifling. The wing length of 74 adult males of nominate *aeneum* is 47-53 (average 50.3) mm., compared with 51-54 (average 52.4) mm. in 26 adult males of *becki* (cf. also table 3). It appears from this table that there are small differences in wing length even between the populations belonging to nominate *aeneum*.

This form is restricted to the island of Guadalcanal.

TABLE 3
WING MEASUREMENTS (IN MILLIMETERS) OF *Dicaeum aeneum*
(The figures in the body of the table are the number
of specimens measured.)

	Males									Females					
	47	48	49	50	51	52	53	54	45	46	47	48	49	50	51
Buka	—	—	—	—	1	—	—	—	—	—	—	1	—	—	—
Bougainville	—	2	2	7	6	6	2	—	—	—	1	2	2	2	1
Fauro	—	—	1	—	1	2	—	—	—	—	—	—	—	—	—
Choiseul	1	1	7	10	4	1	—	—	5	6	5	4	—	—	—
Santa Isabel	—	—	5	4	4	—	1	—	—	1	5	2	1	—	—
Florida	—	—	—	3	1	—	—	—	—	—	—	1	—	—	—
Tulagi	—	—	1	—	—	1	—	—	—	—	—	2	—	—	—
Guadacanal	—	—	—	—	6	7	9	4	—	—	2	6	9	1	—
Malaita	—	—	—	2	4	9	5	1	—	—	5	10	6	—	—

***Dicaeum aeneum malaitae*, new subspecies**

TYPE: A.M.N.H. No. 227420; adult male; Malaita, Solomon Islands; February 5, 1930; Whitney South Sea Expedition.

Differs from the preceding races in having the gloss of the upper parts reduced to a faint bluish tinge and in having a much thinner, more slender, and much longer bill. In addition, the slate color of the under parts is slightly paler than that in the two other races. The color of the flanks is about intermediate between that of nominate *aeneum* and that of *becki*. The wing length is similar to that of *becki*. The length of the bill, measured from the skull, in 40 males and females (which are similar in this respect) is 13.0–15.5 (average 14.3) mm.,

TABLE 4
LENGTH (IN MILLIMETERS) OF THE BILL MEASURED FROM THE
SKULL IN *Dicaeum aenum*
(The figures in the body of the table are the number
of specimens measured.)

	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0	15.5
Buka											
Males	—	—	—	1	—	—	—	—	—	—	—
Females	—	—	—	1	—	—	—	—	—	—	—
Bougainville											
Males	—	2	5	9	7	2	—	—	—	—	—
Females	1	4	1	2	—	2	—	—	—	—	—
Fauro, males	—	—	—	1	2	—	—	—	—	—	—
Choiseul											
Males	—	—	4	11	7	2	—	—	—	—	—
Females	—	3	2	12	1	2	—	—	—	—	—
Santa Isabel											
Males	—	1	1	8	4	—	—	—	—	—	—
Females	—	1	2	4	2	—	—	—	—	—	—
Florida											
Males	—	—	—	—	2	2	—	—	—	—	—
Females	—	—	—	—	1	—	—	—	—	—	—
Tulagi											
Males	—	—	—	—	2	—	—	—	—	—	—
Females	—	—	—	1	—	1	—	—	—	—	—
Guadalcanal											
Males	—	2	2	10	8	4	—	—	—	—	—
Females	—	1	1	8	5	3	—	—	—	—	—
Malaita											
Males	—	—	—	—	—	—	4	6	3	5	2
Females	—	—	—	—	—	2	3	6	4	5	—

compared with 10.5–13.0 (average 12.0) mm. in 116 specimens of nominate *aeneum*, and 11.0–13.0 (average 12.2) mm. in 44 specimens of *becki* (cf. table 4). The new form inhabits Malaita Island.

Dicaeum tristrami Sharpe, 1884

TYPE LOCALITY: San Christobal.

This species, restricted to the island of San Christobal, is so aberrant that it cannot be united with the above-mentioned species in the same superspecies. Its brownish, nondescript plumage, lack of sexual dimorphism, and blunt and heavy bill make it a very different bird. It gives the impression of being a secondarily "generalized" species and is probably a remnant of an invasion independent of and much older than that which brought *aeneum* to the Solomon Islands. It forms one of the many striking examples of the faunal independence of San Christobal.

The extensive material of the American Museum of Natural History has been examined.

TYPE SPECIMENS EXAMINED

Dicaeum obscurum Ogilvie-Grant, 1894 = *D. hypoleucum obscurum*. In the British Museum.

Dicaeum Everetti Tweeddale, 1877 = *D. hypoleucum pontifex*. In the British Museum.

Dicaeum modestum Tweeddale, 1878 = *D. hypoleucum pontifex*. In the British Museum.

Dicaeum mindanense Tweeddale, 1877 = *D. hypoleucum mindanense*. In the British Museum.

Dicaeum hypoleucum Sharpe, 1876 = *D. hypoleucum hypoleucum*. In the Museum of Zoology, University of Michigan, Ann Arbor.

Dicaeum tickelliae Blyth, 1847 = *D. erythrorhynchus erythrorhynchus*. In the British Museum.

Dicaeum erythrorhynchus ceylonensis Babault, 1920 = *D. erythrorhynchus ceylonense*. In the British Museum.

Dicaeum minullum subflavum Stuart Baker, 1921 = *D. concolor concolor*. In the British Museum.

Dicaeum olivaceum Walden, 1875 = *D. concolor olivaceum*. In the British Museum.

Dicaeum inornatum Sharpe, 1885 = *D. concolor olivaceum*. In the British Museum. See the remarks in the present paper on page 11.

Dicaeum virescens Hume, 1873 = *D. concolor virescens*. In the British Museum.

Dicaeum minullum borneanum Lönnberg, 1925 = *D. concolor borneanum*. In the British Museum.

Dicaeum sollicitans Hartert, 1901 = *D. concolor sollicitans*. In the American Museum of Natural History.

Dicaeum pygmaeum palawanorum Hachisuka, 1926 = *D. p. palawanorum*. In the British Museum.

Dicaeum davao Mearns, 1905 = *D. pygmaeum davao*. In the United States National Museum.

Dicaeum vulneratum Wallace, 1863 = *D. vulneratum*. In the British Museum.

Dicaeum schistaceiceps G. R. Gray, 1860 = *D. erythrothorax schistaceiceps*. In the British Museum.

Dicaeum misoriense Salvadori, 1876 = *D. pectorale misoriense*. In the American Museum of Natural History.

Dicaeum geelvinkianum setekwa Rand, 1941 = *D. pectorale setekwa*. In the American Museum of Natural History.

Dicaeum geelvinkianum centrale Rand, 1941 = *D. pectorale centrale*. In the American Museum of Natural History.

Dicaeum geelvinkianum diversum Rothschild and Hartert, 1903 = *D. pectorale diversum*. In the American Museum of Natural History.

Dicaeum geelvinkianum simillimum Hartert, 1930 = *D. pectorale diversum*. In the American Museum of Natural History.

Dicaeum rubro-coronatum Sharpe, 1876 = *D. pectorale rubrocoronatum*. In the British Museum.

Dicaeum pulchrius Sharpe, 1884 = *D. pectorale rubrocoronatum*. In the British Museum.

Dicaeum geelvinkianum violaceum Mayr, 1936 = *D. pectorale violaceum*. In the American Museum of Natural History.

Dicaeum nitidum Tristram, 1889 = *D. pectorale nitidum*. In the British Museum.

Dicaeum geelvinkianum rosseli Rothschild and Hartert, 1914 = *D. pectorale rosseli*. In the American Museum of Natural History.

Dicaeum eximium Sclater, 1877 = *D. eximium eximium*. In the British Museum.

Dicaeum aeneum becki Hartert, 1929 = *D. a. becki*. In the American Museum of Natural History.

Dicaeum aeneum malaitae Salomonsen, 1960 = *D. a. malaitae*. In the American Museum of Natural History.